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Staying Within or Leaving the Apprenticeship System? Revisions of Educational Choices in Apprenticeship Training

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Summary

The decision to revise an educational choice has hardly been analyzed in previous research. Dropping out is only one possible choice, and we distinguish between dropping out (leaving the apprenticeship system) and changing or upgrading (staying within the apprenticeship system) as three possibilities to revise an educational decision, using a dataset that consists of apprentices who have dissolved their apprenticeship contract. We analyze the determinants of leaving apprenticeship training using competing risks models. Dropout decisions seem to be driven by financial considerations such as financial distress, but local labor market conditions seem to have no effect on them. Our findings underline the importance of distinguishing between the different choices instead of focusing exclusively on dropping out.

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1 Introduction

The determinants and consequences of dropout behavior have received considerable attention from researchers in the past. An extensive literature examines the long-term development of high school dropout rates (Heckman/LaFontaine 2007), possible determinants of the decision to drop out of high school (Card/Lemieux 2000), and its long-term consequences (Oreopoulos 2007). Much less attention has been paid to the possibility that youths may simply *revise* an educational decision after a temporary dropout and actually stay within the educational system, and similarly, much less is known about the determinants of behavior in apprenticeship training. There are three different possibilities for revisions: youths might change to another schooling choice, they might choose a more challenging educational program or they might drop out of the educational system and either work as unskilled workers or end up unemployed.[1] We call these three different choices *changing*, *upgrading* and *dropping out*, respectively, and provide the first economic analysis of revisions of educational choices. In this article, we focus on the distinction between staying in the apprenticeship system (i.e. changing) and leaving it (i.e., upgrading one's educational career by going back into general schooling or entering university, or dropping out).

We believe that it is important to distinguish between the three different choices for the following two reasons. First of all, treating all youths who decide to revise an educational decision as dropouts might result in aggregation bias, biased results for the determinants of dropout decisions and overestimation of dropout rates. While the first two possible choices (changing and upgrading) are rather unproblematic with respect to long-term labor market consequences, only the last one (dropping out) carries higher risks, because increasing qualification requirements and technical progress give dismal prospects to the unskilled and low-skilled labor force. As pointed out in previous research (Schmid/Stalder 2012), dissolving an apprenticeship contract can also be seen as a dissolution of bad matches on the apprenticeship market and result in higher satisfaction with a new apprenticeship, if apprentices manage to find another training place. Secondly, treating all revisions as dropouts results in lower estimation efficiency as compared to distinguishing between the three different possible choices.

For our empirical analysis of the decision to revise an educational choice, we use a German data set on revisions of the decision to start apprenticeship training. The big advantage of this data set is that the different choices can be distinguished very clearly, instead of focusing solely on dropouts as one educational revision. In addition to this differentiation, the data set also allows to take into account non-financial as well as financial opportunity costs of apprenticeship training and perceived bad prospects after finishing apprenticeship training, which was not possible in research using other data sets. We estimate a competing risks model where we compare the determinants of the choice to leave apprenticeship training (i.e., to drop out or to upgrade) vs. the decision to stay within apprenticeship training (i.e., to change).

Our results suggest that financial incentives seem to matter for the decision to drop out of apprenticeship training. Those individuals who named financial distress as a reason to dissolve their apprenticeship contract have significantly higher hazards of dropping out, as compared to upgrading or changing. We also find that apprentices' previous level

[1] This is a simplified approach based on previous work, e.g. by Neuenschwander (1998, 1999) and Neuenschwander et al. (1996). More detailed models might also include choices such as changes to a more or less challenging occupation.

of schooling matters for their educational choices: those with higher levels of previous schooling are more likely to upgrade and less likely to drop out as opposed to staying within apprenticeship training. Surprisingly, local labor market conditions neither affect the hazards of upgrading nor of dropping out. However, the most important novel result is probably the importance of financial reasons for an individual's decision to drop out.

The remainder of our paper is organized as follows. Part 2 presents a brief literature review. Part 3 gives some background information on the main institutional features of the German educational system with a special emphasis on apprenticeship training and introduces the data set that we used. Part 4 presents theoretical considerations and discusses the choice of covariates for the empirical analysis. Part 5 presents and discusses the estimation framework for the empirical analysis and the estimation results, while part 6 concludes.

2 Literature Review

While there is quite a substantive body of research on high school dropouts, there is almost no previous research on other revisions of educational choices, and much less research on dropouts in other institutional settings, such as apprenticeship training. A notable exception are the research works by Neuenschwander (1998, 1999) and Neuenschwander et al. (1996). However, we think that the findings from the studies on high school dropouts are relevant for our research topic as well because the deicision to drop out is one possible choice in our analysis. Previous studies typically find that more able individuals are less likely to drop out (see, for instance, Bishop/Mane 2001 for the United States or Bradley/Lenton 2007 for the United Kingdom). The same seems to be true for apprentices where studies find that prior level of schooling seems to play an important role for changing and dropout decisions. Previous research (Neuenschwander et al. 1996, Neuenschwander 1998, 1999; Alda 2003, Schöngen 2003, Stalder/Schmid 2006) finds that youths with a higher level of previous schooling are less likely to drop out (as opposed to staying within the educational system) and less likely to change (as opposed to staying within their chosen occupation). The importance of schooling can be due to two reasons: on the one hand, longer schooling should be associated with more ability and hence lead to less schooling problems, which can subsequently lead to the decision to quit the training because of high non-monetary costs. On the other hand, more schooling seems to lead to better decision-making abilities (Cutler/Lleras-Muney 2006), so there are probably less matching problems and resulting dropout decisions. Additionally, youths with more prior schooling have in general a larger set of choices available, so they are probably less often forced to start an apprenticeship just because it was their only option. This probably also leads to better matches.

In addition to cognitive ability, other factors related to match quality might also play an important role for apprentices' decisions to revise educational choices. Fries et al. (2013) analyze the effect of an employment subsidy on dropout behavior of apprentices. Interestingly, they also find that personal preferences, such as conflicts with colleagues or supervisors, a lack of interest in the apprenticeship or a mismatch between expectations about the apprenticeship and reality are important reasons to drop out. The lack of information about these possible determinants in the dataset used in our analysis means that we are not able to analyze them in more detail in our analysis, though.

Previous research also finds important differences in behavior with respect to ethnicity. While studies for the United States and the United Kingdom find that members of minori-

ties are less likely to drop out (see Nguyen et al. 2006 for the US and Bradley/Lenton 2007 for the UK), the results are the opposite for apprenticeship training in the German-speaking countries, and youths with non-German parents seem to fare worse than natives in the apprenticeship training system. Neuenschwander (1999) finds that apprentices without Swiss citizenship are more likely to drop out, Stalder and Schmid (2006) find that natives are significantly more likely to continue their education, and Schöngen (2003) reports that less ex-apprentices with non-German parents are still planning to continue their education.

Finally, the regional labor market situation is another possible impact factor on educational decisions. Montmarquette et al. (2007) find that a higher minimum school-leaving age, lower minimum wages, and higher unemployment rates all decrease dropout probabilities in Canada. Neuenschwander (1999) finds that there are many apprenticeship dropouts in Switzerland in fields where there are abundant employment opportunities for unskilled workers. Mocetti (2012), however, finds no effect of regional youth unemployment rates on school dropout behavior in Italy.

These previous findings suggest that it is important to control for ability, ethnicity and regional labor market situation in an analysis of revisions of educational choices.
In the next section, we will provide some background information on the German educational system and introduce the data set that we used for the empirical analysis.

3 Data and background

3.1 Data

Our empirical analysis of dropout and changing behavior of apprentices is based on a survey of the German Federal Institute for Vocational Education (*Bundesinstitut für Berufsbildung*) in 2002 (Schöngen/Menk 2002).[2] Its main advantage is that it allows to distinguish the three different possible revision decisions very clearly. In addition, it contains extensive information on the reasons for the youths' decision to cancel their apprenticeship. There are several questions that allow us to analyze possible impact factors that have never been used in previous research on the topic, such as the importance of exam nerves or financial distress. However, as this is a cross-sectional dataset, there is no possibility to assess the probability that dropouts might still re-enter the educational system. About one third of dropouts is still planning to find another apprenticeship place, but it is impossible to analyze their success using this dataset.

The data set also includes information on the regional provenance of respondents. This enabled us to include regional-level regressors. A more detailed description of the dataset and descriptive statistics can be found at www.jbnst.de/en.

3.2 Institutions

The following paragraphs give a very brief description of some important characteristics of the German system of dual vocational training as it relates to our research topic. For a more complete description, see, for example, Hippach-Schneider and Hensen (2011). Firm-provided apprenticeship training is still one of the most important ways of entering the labor market for youths in the German-speaking countries (Ryan 2001). In Germany, for example, 56.9% of all school leavers started an apprenticeship in 2012, and 24.4%

[2] More detailed information on data can be found in the data description at www.jbnst.de/en.

of all apprenticeship contracts were dissolved prematurely in 2011 (Bundesinstitut für Berufsbildung 2013), which means that those apprentices either changed into another apprenticeship, upgraded their educational choice, or dropped out.

After their school graduation, youths who want to continue their education can either study at universities or polytechnics (*Fachhochschulen*) if they hold the necessary qualification, enter dual apprenticeship training or full-time vocational schools (*Berufsfachschule*).[3] The focus of this work is on revising educational decisions in apprenticeships in dual apprenticeship training. It consists of in-firm training at the workplace and classes at a vocational school (*Berufsschule*). At the moment, there are nearly 350 state-approved apprenticeship occupations. They last between 2 and 3.5 years and are of general nature because they finish with a recognized degree, and apprenticeship standards are set centrally. Apprentices earn a small wage set in a collective wage agreement and paid by their training firms, and youths find their training place either on their own initiative or through the intermediation of the local employment agency or other institutions.

4 Theoretical considerations

The economic theory of human capital as pioneered by Becker (1962) predicts that a rational agent will invest in education (as in any other asset) only if it yields a positive net present value (NPV). Future cost and benefit streams can be discounted in order to make different alternatives comparable and to identify the optimal one. For several available choices, an individual will pick the one that yields the highest net present value.

As we analyze the decision to revise educational choices, we have to slightly adjust this framework and incorporate learning about job or occupation characteristics into the decision framework. A key feature of educational decisions is that decisionmakers typically have only incomplete information about costs and benefits related to their choice. Apprentices will revise an educational choice after learning more about its characteristics if the updated expected utility flows outside this choice exceed the updated expectations of their current choices, plus the costs of changing. A choice that may initially have seemed profitable might, *ceteris paribus*, become unprofitable from an individual's point of view because of higher than initially expected costs or lower than expected benefits.[4] This new information that apprentices can acquire during their training might then lead them to revise their initial educational choice in two different directions: they might either upgrade their educational investment by re-entering general education or entering university, or they might stop their educational investment altogether and drop out. Those two different choices of exiting apprenticeship training should be driven by different determinants. In order to analyze them, we used several financial and non-financial measures of costs and benefits of apprenticeship training that we discuss in the following section.

[3] These schools exist, among others, for training in technical, health-related or business-related occupations. Some examples are chemical-technical assistants or nurses.

[4] An example is the opportunity cost of an apprenticeship training as measured by the relative wage of apprentices to the wage for unskilled workers. Even if this information might be available *ex ante*, adolescents might not fully realize the cost until they start their apprenticeship training. Having heard about the apprenticeship wage and actually having to "make do" with it might lead adolescents to reconsider their initial decision.

As shown in previous research, the prior level of schooling of respondents should influence their costs of finishing an apprenticeship.[5] Those with more previous education should, *ceteris paribus*, incur lower learning costs and therefore have lower dropout hazards. They should also have higher hazards of upgrading their educational choice because only the holders of an *Abitur* or *Fachabitur* are allowed to enroll in universities or universities of applied sciences (*Fachhochschulen*). Therefore, we expect individuals with more education to have lower hazards to drop out as opposed to changing and to have higher hazards to upgrade as opposed to changing. We included four dummies for respondents' previous level of schooling (school dropouts, *Realschule*, and *Gymnasium*, as well as the ones who hold a *Fachabitur*), using the *Hauptschule* graduates as a baseline category.

Next, lower financial opportunity costs of apprenticeship training should lead to lower hazards of dropping out, but should not affect the hazard to upgrade. The reason is that only dropouts can start working as unskilled workers and realize a higher income by doing so. Therefore, we constructed a measure of the opportunity cost of an apprenticeship training, namely, the relative wage of apprentices as compared to unskilled workers in the same sector.[6] The higher this ratio, the less an apprentice can gain from quitting his training in favor of working as an unskilled worker, and the less likely he should be to drop out. For the upgraders, however, there should be no effect of this variable.[7]

Two other cost measures ask for exam nerves and for financial distress during apprenticeship training as reasons to dissolve the first apprenticeship contract. Exam nerves are a form of non-monetary costs due to stress and perceived mental overstrain of school, and we expect those who suffer from exam nerves to have higher hazards to drop out and lower hazards to upgrade because the exam nerves would probably get even worse in a more challenging educational program. For those who experienced financial distress, we expect higher hazards to drop out because this allows them to work as an unskilled worker and have a higher income in the short run. We also expect lower hazards to upgrade for them because enrolling in a more challenging program would mean that they have to spend an even longer period of time with a low income.

A last cost-related possible impact factor might be being a girl in a predominantly male occupation or, vice versa, a boy in a predominantly female occupation, defined as occupations with on average more than 60% apprentices of the other gender. The cost could be due to the fact that youths without peers of the same sex are more often the victims of

[5] Previous level of schooling can be seen as a broad measure of ability, but it probably also captures other characteristics, such as students' family background. This might bias the estimated coefficients on schooling level and should be kept in mind when analyzing them. Including items on more precise ability measures such as respondents' IQ in more datasets would be desirable to overcome this problem.

[6] The Federal Institute for Vocational Education and Training (*Bundesinstitut für Berufsbildung*, BiBB) gathers data on the average salary that the apprentices are paid (*Ausbildungsvergütungen*), while the state-level statistical offices compile statistics on the average salaries for workers, depending on their skill-level and the industry sector where they are working. However, these average salaries for unskilled workers are not available for all industrial sectors, reducing our sample size by approximately one third. They are only available for workers in construction, the metalworking industry, automobile trade and repair, and the credit and insurance industry.

[7] There might be the possibility that higher apprentice pay in an occupation might attract more able apprentices, and this might lead to results being driven by differences in ability and not differences in relative pay. Again, the lack of information on apprentices' ability prevents us from controlling for this possibility.

bullying at work (see, for instance, Litzcke 2003). We expect higher hazards of dropping out for apprentices in these occupations, but no impact on upgrading.

On the benefit side, we expect local labor market conditions[8] to affect the different choices in different ways. Wheeler (2001) shows in a matching model that "thicker" labor markets, i.e. larger labor markets such as those in cities and agglomerations with more employers, lead to better matching between workers and firms due to lower search costs. This leads to higher productivity, higher inequality (in pay between different skill groups) and higher expected returns to skill. Hence, apprentices in "thicker" labor markets should have more incentives to invest in their human capital and complete their training, *ceteris paribus*, than their counterparts in areas where the labor market conditions are less favorable. We therefore expect higher hazards of dropping out in regions with a "thin" local labor market, but no effect on upgrading as opposed to staying.[9] For the labor market supply side, we used the density of the working age population between 15 and 65, and for the demand side, we used the local unemployment rate as a proxy for the "thickness" of local labor markets.[10] Additionally, the availability of public transport and traffic routes should also influence the "thickness" of a local labor market. Commuting should be much easier in areas where there is a better transport network disposable because more jobs can be reached within reasonable time spans. We included the "population accessible by public transport within one hour", a commonly used measure in regional planning, as a measure of transport smoothness that should affect the "thickness" of local labor markets.

Three questions aim at capturing the perceived long-term benefits of an apprenticeship: they ask for the importance of bad employment prospects after the apprenticeship, bad income and bad career prospects, respectively.[11] With respect to those long-term determinants, we expect a high importance of bad prospects as a reason to upgrade. When apprentices realize during their training that their chosen occupation has bad career prospects or income prospects, they should have incentives to upgrade their education with resulting better career and income prospects and therefore have higher hazards to upgrade as opposed to changing. For the decision to drop out as opposed to staying within the apprenticeship system, we expect no effect of those three variables.

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[8] As the spatial bound of a local labor market, we took the size of the respective Chamber's area. The relative immobility of apprentices can be seen as a justification for this simplifying assumption.

[9] Data on district level are available from the German Federal Office for Building and Regional Planning's "Indicators and Maps on Spatial and Urban Development" (*Indikatoren und Karten zur Raum- und Stadtentwicklung*, INKAR). These district-level data were then aggregated on chamber level and merged to the original data set, so that each individual was also assigned regional-level characteristics. We used information on regional unemployment rates, surface, working age population (between age 15 and 65) and availability of public transport. The working age population density is calculated as the ratio of working age population and surface. The availability of public transport is measured as the population that can be reached within one hour by public transport ("*Erreichbares Bevölkerungspotential*"), a commonly used measure in spatial development research.

[10] Results did not change when we used the youth unemployment rate instead.

[11] Labor market data on wages for successful graduates of apprenticeship training would probably provide a better measure of long-term benefits. However, there are two main reasons why this impossible: first of all, not all apprentices work in their apprenticeship occupation after their graduation. See Seibert (2007) for more details. Secondly, and more importantly, wages by occupation are only available on the national level and for former Eastern vs. former Western Germany, but not at the federal state or even local level that would be needed for our analysis. Therefore, we used the (possibly) distorted measure reported by the respondents instead.

In order to control for the fact that there are considerable differences in the labor markets for apprentices across the different regions in our data set, we also used data from the German Federal Employment Agency's statistics (*Bundesagentur für Arbeit*) on the labor market for apprentices and on the numbers of youth enrolled in full-time schools for usually dually provided occupations. The employment centers gather information on registered apprenticeship-seeking youths and on registered open apprenticeship places, and calculate a supply-demand ratio (the number of offered apprenticeship places per 100 apprenticeship seekers).[12] Secondly, we included a measure aiming at capturing the relative frequency of non-firm-provided training in full-time vocational schools (*überbetriebliche Ausbildung*). This is a labor market policy measure where youths complete apprenticeship training in full-time schools, and not in both a firm and a school. We included the percentage of youths in this labor market measure among all youths in apprenticeship training in a region to control for the situation on the market for apprenticeships. These regressors were included to control for the fact that it is easier to find a new apprenticeship place in more favorable local training markets, leading to lower hazards of dropping out. However, the situation on the market for apprenticeships should clearly not affect the hazards of upgrading.

Finally, we also included control variables for gender, having non-German parents, firm size and field of apprenticeship.

5 Estimation methods and results

5.1 Methods

As we are interested in the timing of the decision to revise an educational choice, we estimated competing risks models.

Cancellations of apprenticeship contracts can occur daily, but are only observed in 5 time intervals (probation time, later during the first year, and in the second, third, and fourth years, respectively.) Therefore, we follow a continuous time hazard function approach where durations are interval censored (Prentice/Gloecker 1978; Narendranathan/Stewart 1993; Jenkins 1995). However, because not all apprenticeships last 3 or 3.5 years, we only included three dummy variables for probation time, later during the first year, and the second year. There are several possibilities to analyze this type of data.

One possibility is to make assumptions about the shape of the hazard rate within each time interval because this shape cannot be identified from the data at hand.[13] Allison

[12] However, as the employment centers can only use registered numbers for their calculations, these numbers do not give a complete picture of regional apprenticeship markets. Many places are filled directly without the intermediation of the job centre and are therefore not included in the centres' statistics. See, for instance, Ulrich (2006) for a more complete discussion of the topic.

[13] An alternative approach would be the one by Meyer (1990), who shows that the discrete form of a continuous time proportional hazards model takes the form of a complementary log-log model. This framework allows to take into account unobserved heterogeneity, also known as "frailty" in the hazard rate literature. We used a parametric Gamma-distributed heterogeneity term and chose this distribution because Abbring and van den Berg (2007) have shown that for exponential mixtures, the distribution of heterogeneity among survivors converges rapidly to a Gamma distribution. However, a test of the null hypothesis that the unobserved heterogeneity variance component is equal to zero could not be rejected. Estimation and test results using this approach are provided in Appendix B at www.jbnst.de/en.

(1982) defines a discrete-time hazard rate P_{tj} for each possible event:

$$P_{tj} = Pr\big(T = t, J = j \mid T \geq t\big) \tag{1}$$

The resulting likelihood function can be written as

$$L = \prod_{i=1}^{n} \left[\frac{P_{t_i j_i}}{1 - P_{t_i}} \right]^{\delta_i} \prod_{k=1}^{t_i} (1 - P_k) \tag{2}$$

Again, as in Allison (1982), we assume a particular functional form for the destination-specific discrete-time hazards and get the following expression:

$$P_{tj} = \frac{\exp[\alpha_{jt} + \beta_j' x_t]}{1 + \sum_l \exp[\alpha_{lt} + \beta_l' x_t]} \quad \text{for } j = 1, \ldots, m$$

which simplifies to the following for our analysis with three possible destinations

$$Pr(T = t, J = j | T \geq t, x) = \frac{\exp[\alpha_{jt} + \beta_j' x]}{1 + \sum_{l \in A,B} \exp[\alpha_{lt} + \beta_l' x]}$$

where $j \in A, B, C$ denotes the three possible destinations of upgrading, dropping out and changing, with the latter being the base category. Substituting (2) into (1) and taking logs, we get the same log-likelihood as the one for a multinomial logit model and can estimate this equation with re-organized data (Jenkins 1995).

5.2 Results

The following table displays results for competing risks estimations. The different states into which a transition is possible are upgrading and dropping out, with the changers as those who stay within the apprenticeship training system as the base category. ***, **, and * denote significance levels of 1 %, 5 %, and 10 %, respectively. We present exponentiated coefficients that can be interpreted as hazard ratios and results for a model with (I) and without (II) the opportunity cost measure.[14] The effect of the regressor of interest on the hazard is significantly positive if the hazard ratio is significantly larger than one and significantly negative if the hazard ratio is significantly smaller than one. Besides that, coefficients can be interpreted similarly to a multinomial logit model. Additional estimations following the approach by Meyer (1990) can be found in Appendix B at www.jbnst.de/en. These estimations confirmed the results presented here.

[14] One might be worried that differences in results between those two estimations are because of differences in sample size and not because of the opportunity cost/relative wage variable. However, estimation results using the first sample but excluding the opportunity cost measure (not shown here) showed identical results, with only very few minor changes in significance levels. Results are available upon request from the corresponding author.

Table 1 Competing Risks Model, exponentiated coefficients

	Upgrade I	Dropout I	Upgrade II	Dropout II
d1	0.693	0.036***	0.672	0.082***
	[0.715]	[0.011]	[0.413]	[0.017]
d2	1.309	0.100***	1.054	0.148***
	[1.339]	[0.029]	[0.650]	[0.031]
d3	1.562	0.289***	1.003	0.291***
	[1.633]	[0.079]	[0.648]	[0.062]
apprenticeship wage/wage unskilled	0.001***	0.004***		
	[0.002]	[0.005]		
1 = non-native parents	0.956	1.421	0.971	1.499*
	[0.487]	[0.403]	[0.351]	[0.322]
1 = female	0.437**	0.672	0.460***	0.697*
	[0.161]	[0.181]	[0.130]	[0.131]
1 = male in occupation with	0.456**	0.82	0.509**	0.838
more than 60% females	[0.182]	[0.174]	[0.151]	[0.139]
1 = female in occupation with	1.662	1.506	1.272	1.189
more than 60% males	[0.629]	[0.405]	[0.359]	[0.224]
1 = school dropout	1.041	1.667	1.559	1.925**
	[1.109]	[0.588]	[1.185]	[0.497]
1 = Realschule	2.364**	0.592***	2.226***	0.602***
	[0.859]	[0.116]	[0.647]	[0.088]
1 = Fachabitur	3.586**	0.236**	4.840***	0.381**
	[2.039]	[0.140]	[2.009]	[0.153]
1 = Abitur	8.222***	0.203**	11.329***	0.334***
	[3.631]	[0.128]	[3.690]	[0.123]
1 = bad prospects	0.375	1.289	1.004	0.957
reason for termination	[0.324]	[0.587]	[0.565]	[0.356]
1 = bad income prospects	0.782	1.648	0.862	1.489
reason for termination	[0.472]	[0.564]	[0.390]	[0.390]
1 = bad career prospects	1.945	0.597	1.486	0.689
reason for termination	[1.077]	[0.317]	[0.658]	[0.278]
1 = exam nerves	0.364	1.081	0.221	0.987
reason for termination	[0.379]	[0.352]	[0.226]	[0.231]
1 = financial distress	0.823	2.565***	0.598	1.769***
reason for termination	[0.621]	[0.679]	[0.363]	[0.361]
local percentage of youth	14.7	0.000	29.728	16.711
in out-of-firm training	[132.361]	[0.000]	[195.902]	[82.084]
local population density	0	0	0	0
	[0.000]	[0.000]	[0.000]	[0.000]
local density of public transport	0.926	8.225	0.686	2.075
	[1.038]	[7.226]	[0.553]	[2.084]
local unemployment rate	0.843	43.165	0.009	96.791
	[6.388]	[215.227]	[0.046]	[327.153]
n	1967		3389	
LogL	−789.456		−1386.96	

d1–d3 denote the timing of the dissolution of the apprenticeship contract (i.e. during probation, later during the first year, and during the second year, respectively). Estimations include controls for the field of apprenticeship, the firm size and various regional labor market characteristics, namely, the local percentage of youth in out-of-firm training, the local population density, the supply-demand ratio on the local market for apprenticeship places, the local density of public transport, and dummies for federal states. The local unemployment rate and the relative apprenticeship wage were rescaled by multiplying them with 100. Estimated coefficients can be interpreted similarly to a multinomial logit model. *n* refers to person-period and not to person observations. Full results can be found in Appendix B at www.jbnst.de/en.

Duration effects are captured by the dummy variables on the period of time in which the apprenticeship contract was terminated (i.e. probation, remainder of first year, second year). While no effects are found for the transition rates into upgrading, those who terminated their contract in these relatively early time periods of their apprenticeship have significantly lower hazards of dropping out. This is a result in line with descriptive previous findings (see, for example, Schöngen 2003). Those youths who have not invested too much time in a first apprenticeship might me more willing to change to another occupation instead of dropping out. This conjecture, however, is impossible to test with the dataset at hand.

The previous level of schooling affects the transition rates into upgrading and into dropping out, as expected. We find that individuals with higher previous levels of education (*Realschule, Fachabitur, Abitur*) have significantly higher hazards of upgrading and significantly lower hazards of dropping out. For the holders of an Abitur, this is probably due to the fact that they also have the right to enter universities or universities of applied sciences (*Fachhochschulen*). Also, the costs of learning are probably lower for individuals with a higher level of education, making them more likely to enter full-time education again. Apprentices who are school dropouts, on the other hand, have a significantly higher hazard of dropping out from apprenticeship training as well. These findings confirm results from previous research on the topic and provide evidence for our theoretical prediction that individuals with more schooling should have higher hazards of upgrading and lower hazards of dropping out.

We expected a high importance of bad income and career prospects on the hazards of upgrading as opposed to changing within apprenticeship training while we did not expect to find any impact on the hazards of dropping out as opposed to changing. However, we find that the hazards of dropping out are significantly higher for those who said thad bad income perspectives were a reason for them to terminate their first apprenticeship in the larger sample. It might be the case that those individuals are planning to enter another educational path but have not done so yet, and it might also be the case that those individuals also are currently in financial distress. In fact, those who cited financial distress as a reason to terminate their first apprenticeship contract are also significantly more likely to drop out as opposed to changing to another apprenticeship, probably also because they have the possibility to work as unskilled laborers and having a higher income than an apprentice by doing so.

We expected that lower financial opportunity costs of apprenticeship training, measured as the apprenticeship wage relative to the wage of an unskilled laborer, should lead to lower hazards of dropping out as opposed to changing, but should not affect the other choice. While this hypothesis is confirmed for the dropouts, we also find that higher relative wages for apprentices lead to lower hazards of upgrading as opposed to changing. A tentative explanation could be that apprentices in relatively well-paid occupations tend to change into similarly well-paid occupations or simply change their training firm but stay within the same occupation.

For youths in occupations with a majority of apprentices of the other gender, we expected higher hazards of dropping out because of a lack of peers of the same gender, but no impact on upgrading. However, we find that boys in a predominantly female occupation are significantly less likely to upgrade as opposed to change within apprenticeship training in the larger sample, while there is no such effect for girls in a predominantly male occupation. This result might be because of large numbers of apprentices with a lower secondary school degree (Hauptschulabschluss/Realschulabschluss) in occupations that

are often chosen by girls, such as retail, office assistant and doctor's receptionist, and a lack of opportunity to upgrade for these apprentices because they are not able to enter university.

We find no effects whatsoever of local labor and apprenticeship market characteristics on upgrading and dropping out, which is surprising. Higher than expected mobility of apprentices and therefore less influence of labor market conditions on their choices might be an explanation for this result.

Similar to previous research findings on the German apprenticeship system, our results suggest that apprentices with non-German parents have higher hazards of dropping out in the larger sample. There are no effects of ethnicity on the hazards of upgrading.

Finally, with respect to gender, we find that female apprentices have significantly lower hazards to upgrade as opposed to changing into another apprenticeship. This could be explained by female apprentices being less confident about entering more challenging educational choices.

The overall results seem to suggest that there are indeed remarkable differences in behavior across the different educational choices and that it is useful to distinguish between them instead of focusing exclusively on dropouts.

6 Conclusion

In the present paper, we analyzed revisions of youths' educational choices. Unlike previous research, we did not focus exclusively on dropping out as one revision of an educational decision, but we analyzed the choices of upgrading and dropping out as opposed to staying within apprenticeship training using theoretical considerations from human capital theory and matching theory. We used a data set on revisions of educational choices in vocational education, where the different choices could be distinguished very clearly.

Our most interesting novel finding is probably the importance of financial incentives as determinants of dropout decisions. It is especially disturbing that youths who named financial distress as the reason for dissolving their apprenticeship contract have significantly higher hazards of dropping out as opposed to graduate. This decision will probably worsen their financial situation considerably in the long term, even if they are better off in the short term with the higher salary of an unskilled worker as compared to the apprenticeship wage. There are two candidate explanations for the importance of this result. The first one is that dropouts might suffer from a lack of awareness for the long-term consequences of their dropout decision, either because they do not have information about wages for graduates and dropouts from apprenticeship training or because they duck issues. The second one is that their discount rate for future payoffs is simply too high, implying that it is indeed a rational decision for them to drop out given their individual discount rate. However, with the information available in this dataset, we are not able to analyze these conjectures in more detail.

Revising an educational choice is not risky, but dropping out of the educational system without a certificate that qualifies its holders for skilled jobs and many further training possibilities is. Our results indicate that there are indeed different determinants for the different educational choices. In order to avoid "true" dropouts as opposed to changing and upgrading behavior, there are several tentative policy implications based on our research findings. Increasing youths' awareness for the long-term consequences of dropping out (including the foregone earnings losses due to lower wages and higher unemployment risk

for unskilled workers) might be a promising strategy. Given the fact that financial distress seems to be one of the main reasons to drop out completely, policies to improve secondary school students' financial literacy could be helpful to avoid getting into financial distress in the first place. This strategy is likely to be more cost-effective than increasing apprentices' wages in order to avoid financial distress, and given the fact that training firms in Germany already bear net losses in apprenticeship training (Dionisius et al. 2009), it is also not likely to reduce firms' willingness to provide apprenticeship training as an increase of wages probably would.

The main disadvantage of the data set that we used for the empirical analysis is without any doubt the fact that it does not contain a true control group of successful graduates from apprenticeship training. In addition, the lack of information on other possible determinants such as the apprentices' family background is a drawback. However, as there are not many datasets available that contain information on revisions of educational choices, we still believe that our results are interesting. We also hope that they might lead to the development of studies focusing on revisions or to the inclusion of questions on revisions and educational histories in existing data sets and studies.

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